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ABSTRACT

A study was conducted to evaluate the impact of the Problem-Oriented Medical Information System (PROMIS), which is based on an automated problem-oriented medical record, by comparing the records for two generally comparable medical wards, one using the computerized PROMIS record and the other using its manual prototype. This report provides a comparative assessment with respect to various indices of the process and record of care delivery, and contains a descriptive documentation of the background and conduct of the demonstration with emphasis on the reactions of users. PROMIS collates and records all data according to relevant medical problems so that each medical service provider is aware of the reason for the service and how it relates to the total care regimen. Features include facilitating coordinated, unified medical care; providing a constant guide to common medical practices for each phase of care; warning of contraindicated therapy and drugs; and the ability to accumulate new information and provide ready feedback. (Author/FM)

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RESEARCH SUMMARY SERIES

A Demonstration of PROMIS

The Problem-Oriented Medical Information System at the Medical Center Hospital of Vermont

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William C. Stratmann, Ph.D.

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This *NCHSR Research Summary* is based on an evaluation of the Problem-Oriented Medical Information System (PROMIS), conducted by the University of Vermont, Burlington. The research was performed for NCHSR under contract HRA 320-75-0204.

An earlier report on the PROMIS project, *Automation of the Problem-Oriented Medical Record,* order number PB 263 578, and an NCHSR Research Digest of the report, order number PB 266 881, are available from NTIS.

Other NCHSR reports on hospital based information systems are *Evaluation of a Medical Information System in a Community Hospital,* available under NTIS order number PB 264 353; and *Demonstration and Evaluation of a Total Hospital Information System,* (HRA) 77-3188, available from NCHSR.

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Foreword

The development of the Problem-Oriented Medical Information System (PROMIS) has provided the opportunity to demonstrate and evaluate the utility of the problem-oriented medical record approach to health care delivery. There is wide difference of opinion on the usefulness of this new approach to medical record use, and while the potential impacts of the approach are broad, little information currently is available to provide evidence of its utility.

PROMIS is based on an automated problem-oriented medical record which has the capacity to interrelate the patient's history, treatment record, and findings of tests and observations so that they bear directly on the principal problem. Among its features, the computerized system facilitates unified, coordinated medical care, and is able to accumulate new information and provide ready feedback.

This evaluation compares PROMIS with its prototype, a manual problem-oriented medical record, focusing on two areas of interest. The study provides a comparative assessment of PROMIS with respect to indices of the process of care and record of care delivery, and documents the background and conduct of the demonstration with emphasis on the behavioral responses of the users of PROMIS. Since the system still is under development, it is hoped that this information will prove of value in better realizing the potential capabilities of this innovative approach to care delivery.

Gerald Rosenthal, Ph.D.
Director

September 1979

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Introduction

The Problem-Oriented Medical Record (POMR) is a new approach to medical record use. POMR organizes medical record information under specific patient problems, rather than by the source of this information, such as laboratory or X-ray reports.

Advocates of the system view it as both a tool and a philosophic approach to care delivery. They believe that the problem-oriented approach brings necessary, long-missing order and discipline to the practice of medicine: that it encourages and facilitates more thorough, reliable, and efficient care, and that it helps to create a relatively unambiguous record of the actual care process.

Critics argue that the POMR approach and its applications place too much emphasis on form, which is time consuming and distracting from what are believed to be much more fundamental elements of care delivery.

Those who support the system admit that without strong leadership and full commitment to its basic philosophical principles, the tool itself may effect little improvement in the process of care delivery. Those who disparage the new approach believe that these demanding prerequisites to practical use of the tool ignore reality and the limits of patient and physician motivation and cooperation.

As with any innovative device, experience prompts its developers to experiment further with the basic design and its extensions. The *manual* Problem-Oriented Medical Record (MPOMR) has evolved into its *electronic* successor, the Problem-Oriented Medical Information System (PROMIS), of which the Computerized Problem-Oriented Medical Record (CPOMR) is an integral part. Because the CPOMR System (as represented by PROMIS) has potential for unique effects on teaching, patient care, and quality assurance activities, no single evaluation project can hope to answer all questions. Each setting within which such a system would be adopted represents a unique combination of opportunities for assessment and limits on generalization of findings. These difficulties are made more acute by ongoing developments in the system that are inevitably stimulated by the evaluation process itself.

Such constraints limit the degree to which definitive findings can be obtained and generalized. The development of such technology even after it achieves operational status should be guided by an ongoing process of external evaluation that can challenge assumptions, identify limits to potential usefulness that might be modified, and provide a basis for more rational

development and application. It was to this end that the project reported here was undertaken at the request of NCHSR.

While the potential impacts of PROMIS are broad, only certain aspects were examined in this study. In particular, the purpose of this project was to compare PROMIS (the CPOMR System) with its prototype (the MPOMR System); more specifically, the purpose was to examine the hypothesis that:

> ". . . the computerized problem-oriented medical information system (PROMIS) induces in its users a behavior pattern toward patient care which is reflected in more complete and appropriate patient workups, therapeutic strategies, and follow-through on the workups and therapeutic strategies. The null hypothesis is that no difference exists between users of PROMIS and users of the manual problem-oriented system with regard to these performance parameters." [1]

This study made use of two neighboring, generally comparable medical wards at the Medical Center Hospital of Vermont (MCHV). One of these wards was designated the "experimental" ward; the other, the "control" ward. The central strategy for the assessment of PROMIS involved the comparison of house staff performance in these two ward settings. During the initial stage of the experiment, both wards utilized the hospital's manual problem-oriented medical record system. At a later stage, the experimental ward underwent implementation of PROMIS and conversion to exclusive use of the computerized problem-oriented medical record system, while the control ward continued to use the manual problem-oriented medical record. During both stages of the experiment patients and house staff were distributed between the two wards in as unbiased a manner as possible, given the competing needs of the research study, the medical education program, and patient care operations.

The research strategy was designed to assess the yield of PROMIS at its present state of development. It should be stressed that PROMIS is not complete. Frequent changes were made during the demonstration and much clinical guidance is still to be incorporated in the system. Consequently, any judgment of PROMIS must be tentative until completion of more long-term cost benefit evaluations. Such studies should assess the yield of PROMIS as a tool for the delivery of care (with respect to both process *and* outcome variables), as a consumer-education device, and as a vehicle for the generation of data bases of disease, illness, and therapy in defined patient populations.

Objectives and findings of the evaluation study

The current project had two objectives: (1), the comparative assessment of PROMIS with respect to various indices of the process and record of care delivery, and, (2) the descriptive documentation of the background and conduct of the demonstration with particular focus on the behavioral reactions of users of PROMIS.

Objective [1]

Toward the first objective, three studies were designed:

A. **Clinical indices of care.** PROMIS, through its branching logic style, is intended to facilitate the recognition of medical problems. Problem management programs associated with PROMIS are intended to ensure that problems noted receive some direct action or attention, such as notification of staff or the patient that a problem needs to be studied, requests for diagnostic tests or procedures, and prompt ordering of medications. This study was designed to identify differences that might be observed with respect to these variables and to interpret any such differences if possible. The following sets of indices were designed:

Patient characteristics—Selected demographic data and information about patient problems, including the distribution and nature of active, inactive, and temporary problems;

Processes of care—Investigative actions taken by providers, such as treatment of patient problems, and the frequency, nature, and timing of diagnostic tests, procedures, and consultation requests;

Provision of care—Indices such as provider interpretation of laboratory test reports and the diagnosis and degree of resolution of patient problems;

Temporal efficiency of care—Measures of the elapsed time between problem identification and ordering of tests, diagnosis and the resolution of problems, ordering of tests and report of test results from the laboratory;

Documentation of information—Incidents of omission or commission, such as test results, and the failure of the provider to report goals, plans, or progress notes in association with specific patient problems;

Drug and immunological information—Completeness of the story of drug

use and known allergies and the attention given these during treatment of the patient;

Cost of services rendered—The cost of all diagnostic tests and services provided, exclusive of room cost.

A study of a sample of about 1500 medical records yielded the following findings:

- No differences were found in the mean number or distribution of clinically relevant patient problems, although PROMIS did identify a larger number of non-clinically relevant problems.
- No differences were found in the mean number or distribution of tests or procedures.
- No differences were found with respect to mean length of hospital stay.
- PROMIS resulted in somewhat better documentation of record information, such as, completeness of data base, and establishment of goals, plans, and progress notes.
- No differences were found in the accuracy of documentation of physician acknowledgment of test results.
- PROMIS resulted in somewhat slower problem identification and ordering of tests.
- No differences were found in the accuracy or availability of histories of drug allergy.
- PROMIS was less effective in documenting use of tobacco and alcohol.
- No differences were found in the mean cost of patient services performed.

B. Subjective perceptions of the utility of the record. Efforts to assess medical care delivery are necessarily dependent upon the *quality of the record of medical care*. Objective and unequivocal assessment of the delivery of care requires an unambiguous and consistent documentation of all related events and decisions. Both the MPOMR and PROMIS have been designed to facilitate the audit of care delivery. In this study a national sample of physicians was asked to determine which of two alternative record systems best serves the function of audit. For purposes of effective audit, the record should be unambiguous: thorough, reliable, and analytically self-explanatory. For purposes of efficient audit, the record should be concise and information should be readily accessible and well-organized.

This study involved assessment of a sample of 69 different matched pairs of comparable record cases from the two wards. These record-pairs were transcribed and submitted to a national sample of 69 resident physicians, whose task was to assess the records from the perspective of the utility of the information contained therein. Each physician was asked to judge which of the two records best provided an understanding of events that transpired during the patient's stay in the hospital. Auditors were requested to distinguish in their assessment between informational content and record format. This study yielded the following findings:

- The PROMIS record was judged to be slightly more thorough.

- No differences were found with respect to either reliability of information or the clarity of logic of provider thought.
- No differences were found with respect to overall information content.
- The PROMIS printed record was judged inferior to the transcribed manual record on the basis of conciseness, accessibility, and organization of record information, all of which are components of record format. (No comparison of printed PROMIS records with untranscribed written records was made, nor were written records in any form compared to electronic PROMIS records.)

This study reinforced the findings of the above study of medical records. Slightly better documentation is attributable to the printed PROMIS record. However, this apparently did not permit the panel of auditors to obtain a better understanding of the reported process of care delivery.

C. **Record utilization as a function of time.** The third clinically-oriented study dealt with the documentation of time. Throughout the course of the demonstration house staff on the experimental ward voiced criticism about the amount of time they had to spend with the new system. This study was designed to test the validity of house staff perceptions of time. The purpose was to measure and compare the time that users in the two wards actually spent with the two medical record systems in fulfilling their responsibilities for patient care.

Observations were conducted of house staff utilization of the respective record systems simultaneously in both wards during work-days for a continuous ten-week period. Contrary to the perceptions of house staff who reported that they found it necessary to spend much more time on recordkeeping activities using PROMIS, our findings show no differences between the amounts of time house staff spent with the two medical record systems. That is, for equivalently staffed wards and patient loads, the total time spent or recordkeeping activities was approximately the same in each ward setting.

Objective [2]

Toward the second objective of this research project, documentation was obtained on responses of health care providers, particularly physicians, to the demonstration of the problem-oriented medical record system. This portion of the research studied the complex social and operational problems associated with user acceptance of the PROMIS innovation. This research was conducted by a team of four junior social scientists (three anthropologists and a sociologist), under the direction of a senior anthropologist.

It was hypothesized that effective utilization of the computerized system in the hospital might vary with:

Experience and familiarity with the tool,
Commitment to the philosophical predicates upon which the tool is based,
User willingness to adhere to its conventions,
The purpose and motivations of the user, and
Situational variables, such as time of day, workload, and case complexity.

The methods employed by this team of researchers included participant observation and informal interviewing, systematic behavioral observations, and structured interviews and questionnaires.

PROMIS was implemented in the experimental ward in December 1976, and has been demonstrated in that ward setting throughout the ensuing period of time. It should be noted that throughout this entire period the system has been continually modified and improved. Many desirable software options were missing at the outset of the demonstration, which adversely affected provider reaction to the system. According to house staff reports, the system still has many negative features, which may be corrected by further program modifications. Some problems of user acceptance are clearly associated with the limited nature of the demonstration. The confinement of the demonstration to a small and relatively isolated general medical ward lessened the willingness of many actual and potential users of the computerized system to commit themselves to the demands of learning to use a new tool and to accept an unorthodox approach to care delivery.

Contrary to the perceptions of many participants in the demonstration, PROMIS did not substantially alter staff procedures or workloads in the experimental ward. The introduction of computer terminals did not change existing ward patterns of patient care. The system neither enhanced nor detracted from patient care.

Although many physicians expressed confidence in the ultimate utility of computerized systems in general, and many expressed a positive attitude toward PROMIS itself, such support was qualified by statements to the effect that the system must be developed further before definitive commitments could be made to its adoption, in either medical education or clinical practice. Consensual attitudes were also expressed about the need for more cooperative and collegial exchanges between PROMIS developers and PROMIS users.

Summary

The *manual* problem-oriented medical record system has successfully been implemented at the University of Vermont College of Medicine and at the Medical Center Hospital of Vermont. It also has been adopted by a majority of physicians affiliated with the College or Hospital. Indeed, many post-graduate physicians, both interns and residents, report that they chose to come to Vermont because of institutional commitment to the problem-oriented medical record.

By contrast, the *computerized* problem-oriented medical record has had only limited application. Favorable judgments about the utility of PROMIS are formulated on the basis of the future potential of the tool and not on the basis of its demonstrated capabilities during the past year.

The demonstration of PROMIS has established that the system can be used in a general medical ward setting. The overall yield of PROMIS in this demonstration setting was only slightly greater than that of the manual problem-oriented medical record. Much greater benefits to users would seem necessary if the system is to stimulate the enthusiasm of the population of health care providers for whom it was designed. The system also should be modified so that it is less demanding of user effort. Users have identified a number of areas that could enhance potential for physician support. Most important of these is simplification of data entry and retrieval.

The PROMIS developers believes that the essential need for effective application is effective leadership. Dependence upon leadership to achieve user compliance, however, is unrealistic. Given the nature of human behavior, it is more likely that general acceptance and utilization of PROMIS will be determined, not by coercion, but by the attractiveness of the system to prospective users.

The PROMIS developers seem to have defined as their major goal the design and implementation of computer software, which if used diligently, may provide an unequivocal record of patient care activities. It assumes dedicated and methodological use (of both input and output) by primary care providers. Thus, the major emphasis has been on technical components, with much less investment of time and energy in the design of user education programs and the assessment of user satisfaction with the system.

[1] Department of Health, Education, and Welfare (DHEW), National Center for Health Services Research Contract HRA 230-75-0204, Evaluation of the Problem-Oriented Medical Information System, 1975.

PROMIS is said to have greater potential than any other existing computerized medical information system. If so, this potential may remain largely unrealized until the PROMIS developers address themselves to the design of a serious strategy of user inducement. Paramount in such a strategy is (1) the identification of services desired by physicians, and (2) the provision of such services at relatively low personal cost of energy, time, or inconvenience to the physician.

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16. Abstracts
Opinions differ widely about the utility of the problem-oriented medical record. This report discusses findings from a study to evaluate the impact of the Problem-Oriented Medical Information System (PROMIS), which is based on an automated problem-oriented medical record, by comparing the computerized record with its prototype, a manual problem-oriented medical record. The evaluation involved two generally comparable medical wards, one using PROMIS and the other using the manual problem-oriented medical record. This report is a comparative assessment with respect to various indices of the process and record of care delivery, and contains descriptive documentation of the background and conduct of the demonstration with focus on the reactions of users. PROMIS, which still is under development, collates and records all data according to relevant medical problems so that each medical service provider is aware of the reason for the service, and how it relates to the total care regimen. Features include: facilitating coordinated, unified medical care; providing a constant guide to

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16. Abstracts (cont'd.)

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